

The first six chapters are devoted to surveying and levelling, and the mensuration of earthworks, the subject being treated with special reference to the class of work which has to be carried out by municipal engineers, such as the laying out of roads, tram-lines, sewers, &c.; next follow three chapters dealing with such general problems as the stresses and strains in beams and struts under given loading, and the methods of determining the necessary scantlings of simple beams and pillars. In a special chapter on the various materials employed in constructional work, the author gives a concise description of their structure, essential properties, manufacture, and the usual methods of testing them to ensure soundness and freedom from all defects. Retaining walls and their design are fully discussed in chapter xvi., and examples are worked out to illustrate the use of the formulæ and the methods of securing safety with economy of material.

The making and repair of roads form a very important part of the duty of a municipal engineer: prior to the advent of the motor-car, the roads outside town areas had been much neglected, and they were in a totally inadequate condition to deal with fast and heavy traffic; as a consequence the questions of road maintenance and road construction have entered during the past ten years upon an entirely new phase. To mention only one of the changed conditions, with horse traffic the dust nuisance was, in country districts, a matter of slight importance; at the present day, on roads on which there is a heavy motor-car traffic, the suppression of dust becomes a factor which must be dealt with, and to which other details may have to be subordinated. In chapter xix. the author gives an excellent abstract of a report upon the proceedings of the International Road Congress, which met in Paris in 1908, prepared for the Local Government Board of Ireland by the chief engineer, Mr. Cowan. This congress agreed to a series of resolutions embodying the views of the delegates as to the lines upon which in the future roads should be constructed and maintained, and also as to how best to cope with the dust problem, though at present opinion is divided as to the respective merits of surface tarring and tar-macadam.

A valuable chapter is that devoted to the design of structures in reinforced concrete; some excellent notes are given as to the essential qualities of the two materials employed—the concrete and the steel—then a series of simple formulæ is worked out, and, finally, typical illustrations of design are given, such as floors, piles, reservoir walls, bridges, and sewers, in each case attention being directed to practical difficulties which have to be met and overcome, if thoroughly sound, durable work is to be produced. This chapter is appropriately followed by one on masonry road bridges and similar work.

The problem of the removal of domestic and trade refuse, solid and liquid, is dealt with in six very complete chapters—one of the best sections, in fact, of the book. All the most modern and efficient methods are discussed and explained, both in regard to the laying out and the construction of sewers, and in regard to the ultimate treatment of the sewage at the

outfall works. An abstract is given of the report of the Royal Commission on Sewage Disposal of 1908, a report which embodies the views of chemists, biologists, and engineers, and is a storehouse of information upon a subject which is of vital importance to the general public, and the layman is as much concerned with the efficient solution of this knotty problem as the engineers who have to design and maintain the necessary works. To make this section of the book complete, the author has added a chapter on the ventilation of buildings and house drainage, in which the best types of modern sanitary house fittings are described, with the help of a series of good illustrations.

Waterworks, their design and maintenance, form the subject of three chapters. Full details are given of the best system of filtration, of methods of softening hard waters so as to render them more suitable for domestic purposes, and of detecting and checking waste of water, a constant source of worry to the engineer in charge of such works; some figures are given to show how excessive this waste by leakage and by the culpable negligence of householders may be, and how important it is to put a stop to it, if needless expense in constructional works is to be avoided, and a shortage of supply in periods of drought prevented.

Constructional steel work is discussed in a very complete chapter. The examples chosen cover a wide range of such class of work—overhead water tanks, roofs, and bridges of various type. The illustrations in this chapter are clear and not overburdened with detail, and are, therefore, much more likely to prove useful to a designer who consults them than is often the case with plates reproducing engineering drawings. For the guidance of young engineers, Mr. Taylor has given a special chapter to the subject of the preparation and drafting of specifications, a chapter which will no doubt be constantly consulted, as it is full of the most useful hints and advice.

Mr. Taylor is to be congratulated on the production of a book which will find a place on the desk and in the drawing office of every civil engineer, and the publishers, too, must be given a word of praise for the excellence of the numerous plates and woodcuts.

T. H. B.

CHEMICAL PHENOMENA OF LIFE.

Chemical Phenomena in Life. By Prof. F. Czapek. Pp. ix + 152. (Harper's Library of Living Thought.) (London and New York: Harper and Bros., 1911.) Price 2s. 6d. net.

MESSRS. HARPER could not have secured a more authoritative or a clearer writer than Prof. Czapek, of Prague, to present to the public the most recent views of biochemistry. The chemistry of protoplasm and its behaviour, as well as that of its constituents, have been greatly illuminated since that branch of chemistry known as the chemistry of colloids has been subjected to investigation. The main properties of colloids were discovered by Thomas Graham in 1861, and the conception of ions we owe to Faraday. Nevertheless, the science of physical

chemistry remained in a dormant condition until van 't Hoff and Le Bel, twenty-one years ago, laid down the famous law named after them, and put forward their views on the nature of solutions. Exact and even mathematical researches in this region were thus rendered possible, and physical chemistry since then has grown at a prodigious rate, and has increased the boundaries of knowledge, not only so far as chemistry and physics are concerned, but also in the biological field as well.

Unfortunately the growth of a new science means the introduction of a new language, and those who write in it are not always able to realise that it is unintelligible even to those who have received a scientific training a few years previously. Such a book as Prof. Czapek's is therefore a godsend, for it explains in the clearest manner the new language as well as the new facts. Although the author is a professor of plant physiology, he treats his subject in a wide manner, so as to be helpful to animal physiologists as well. The properties of colloids, the use of the ultra-microscope, the significance of the protoplasmic membrane, the velocity of reactions, catalysis and the enzymes, and the general laws of immunity are among the subjects treated in somewhat less than 150 small pages. Each page is rich with information and full of thoughtful and pregnant suggestions.

Prof. Czapek concludes that, so far as chemical and physical phenomena are concerned, our knowledge is now sufficiently advanced for us to be quite sure that it is unnecessary to call in the assistance of any mysterious "vital force" in order to explain the activities of protoplasm. The filling in of the still numerous gaps are mostly the working out of points of detail, and that is only a matter of time.

"There is only one part of physiology which is not yet accessible to our methods, and which we cannot prove to be ruled by the well-known laws of inanimate nature. These are the psychological phenomena."

When we remember that less than a century ago organic chemistry was regarded as equally inaccessible to experimental methods, there is some hope that in the future even psychological phenomena may yield their secrets to the investigator. W. D. H.

OUR BOOK SHELF.

Where Do We Come From? Is Darwin Correct? A Philosophical and Critical Study of Darwin's Theory of "Natural Selection." By Herbert Morse. Pp. iv+344. (London: Kegan Paul and Co., Ltd., 1911.) Price 7s. 6d. net.

HAVING read many of the eulogistic articles on Darwin's work which appeared at the time of his centenary, Mr. Morse was prompted to look into the matter for himself. He does not claim for his work any higher authority than that to be granted to the opinion of the man in the street. "Anyone who can read and write, who has the ordinary powers of reasoning, and is possessed of some knowledge of the nature and value of evidence, is as capable of passing as sound an opinion on the value of the theory, that, that evidence endeavours to corroborate as any scientist of them all."

Let us give a few quotations to illustrate the competence and temper of this new philosophical critic.

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"Man is a self-improving organism, no other organism is. Every other organism is the mere sport of nature, at the mercy of environment, a mere physical puppet." The struggle for existence "was the great promoter and agent of variation." This, which is stated as one of Darwin's fundamental propositions, reveals an abyss of misunderstanding. We are treated, as usual, to the old chestnut: "If these new creations were all similar at the outset, it seems inconceivable that any period of time, however prodigious, or any set of circumstances, however extravagant, could by any process of slow accretion have converted, say, a flea into a flamingo."

The author is therefore led to suppose that there were many independently originating primitive organisms. He appears to believe that a theory of phylogenetic evolution is quite anti-Darwinian, and he brings back old times by dividing the animal kingdom into four classes. There have been many stern critics of Darwinism who have done service to evolution-theory, advancing it a little beyond the stage at which Darwin left it, but these have been men careful to understand what Darwin meant, careful not to credit him with conclusions he did not hold, careful to acquaint themselves with the facts of the case. We cannot rank Mr. Morse among these.

The World's Minerals. By Leonard J. Spencer. Pp. xi+212+40 coloured plates. (London and Edinburgh: W. and R. Chambers, Ltd., 1911.) Price 5s.

At first sight one gains the impression that this is merely a remarkably cheap picture-book, published in time to be handy as a Christmas gift. The forty coloured plates exhibit an Oriental splendour and a daring which does not hesitate to represent the play of colours of labradorite and precious opal, or even the metallic lustre of native gold and silver. These dazzling pictures, prepared under Dr. Hans Lenk, of Erlangen, are themselves worth the price of the book, which, however, is far more than a mere album of German chromo-lithographs. For the editor of *The Mineralogical Magazine* has written descriptive text around the pictures, and has preceded this by an excellent introduction to the study of minerals, which makes the book something more than a pretty volume for collectors of pretty stones. Thus in only twenty-two pages the author manages to give a clear and wonderfully comprehensive survey of the difficult subject of crystallography, not even omitting to deal with Miller's notation.

On p. 16 the choice of 2 for the axial ratio of a dimetric crystal is unfortunate, suggesting as it does a simplicity comparable to that of indices, dealt with in the same paragraph. A figure like the 1.771 of anatase would have avoided any such implication. On p. 20 the drawings of rhombohedra are apparently printed upside down, and the hexagonal prism is not satisfactory. These are, however, minor points, and the fact that one can find no worse faults in what amounts to a text-book of systematic mineralogy comprised in the first forty pages, on the forms, physical characters, chemical composition, and classification of minerals, speaks well for the value and accuracy of the work. R. F. G.

The Rubber-Planter's Notebook. By Frank Braham. Pp. viii+108. (London: Crosby Lockwood and Son, 1911.) Price 2s. 6d. net.

This book is what it purports to be, a handy book of reference on Para rubber planting, with hints on the maintenance of health in the tropics and other general information of utility to the rubber planter. It is well written, and the condensed information contained in